

Belongingness Uncertainty: A Comparative Study of African-American Engineering Students'
Experiences at PWI and HBCU

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Abstract

The study examines institutional and professional belongingness as it relates to the perceived interpersonal, instructional, and institutional opportunity structures available for African-American (AfA) engineering students at a Predominantly White Institution (PWI), and a Historically Black University (HBCU) within the Phenomenological Ecological Systems theory (PVEST). A stratified random sample of 65 AfA students (79% male) participated in 11 focus group interviews. Phenomenological analyses of students' responses to open-ended questions revealed that HBCU students experienced a stronger sense of institutional belonging than PWI students. Students from both institutions discussed opportunities and obstacles to embrace a "Black Engineer" identity. HBCU students unlike their PWI counterparts, reported faculty mentoring designed to enhance professional belongingness. The significance of these findings for engineering institutions are discussed.

Purpose

Low enrollment, retention, and graduation rates of African-American (AfA) engineering students in the United States are a cause for concern (NCES, 2009). Consequently, there has been an upsurge of research identifying factors that have contributed to the problems encountered by AfA students in higher education institutions in general, and in STEM fields, in particular (Frehill, Di Fabio, & Hill, 2008; Perna et al., 2009). In this study we focus belongingness uncertainty (Walton & Cohen, 2007) to the institution and profession as it relates to the perceived opportunity structures (DeLeon, Ellis, & Matthew, 2018) among AfA engineering students at a Predominantly White Institution (PWI), and a Historically Black University (HBCU) within an The Phenomenological Variant of the Ecological Systems (PVEST) framework (Spencer, 1999).

Theoretical Framework

PVEST is an extension of Bronfenbrenner's (1979) ecological systems model and integrates considerations of macro and micro-level developmental contexts giving due regard to the individual's developmental needs. PVEST suggests that humans are vulnerable, possessing both risk and protective factors which translate into normative and non-normative challenges and supports to inform developmental trajectories (Spencer, 1999; Spencer, Noll, Stoltzfus, & Harpalini, 2001). Thus, PVEST integrates ecological systems theory with the phenomenological experience of the individual to understand how individuals interact with their contexts – distal and proximal – to forge unique developmental pathways. This framework enables us to examine the contextual feature of PWI and HBCU that contribute to students' senses of belonging and belonging uncertainty among AfA engineering students.

The need to belong, to form and maintain close relationships is a basic human need (Baumeister & Leary, 1995; Ryan & Deci, 2017). Individuals experience a sense of belonging when they feel that they are valued and respected members of a community. However, the stereotyping and stigmatization that AfA students sometimes experience in an academic context creates belonging uncertainty—a global concern and generalized belief that ‘people like me do not belong here’ (Walton & Cohen, 2007; 2017); thereby implicating their personal and collective identities. While White students benefit from a assumed sense of belonging in intellectually evaluative contexts, this sense of belonging may be explicitly challenged for AfA students. Walton and Cohen (20) demonstrated that belonging uncertainty contributed to the disparities in achievement between AfA and White school students. Extrapolating these findings to AfA students in higher education, AfA engineering students are likely to experience greater belonging uncertainty to the institution and to the engineering program relative to White students. We argue that belonging uncertainty engenders discomfort and dissonance among AfA engineering students and likely threatens their self-integrity and feelings of adequacy in the academic context.

Considering the various stereotypes associated with African Americans, particularly regarding their ability to succeed in academic and professional evaluative contexts, it is not surprising that belonging uncertainty dogs AfA students, including AfA engineering students, in higher education. They are often depicted as non-professionals with limited potential and subject to a restricted view of how far they can go professionally (Slay & Smith, 2011). Oftentimes AfA engineering students, particularly students from economically constrained backgrounds may lack role models with strong professional identities they can look up to. They also lack the professional networks taken for granted by their more affluent and mainstream peers (Ibarra,

1999). Finally, AfA engineering students' experiences with structural and systemic institutional racism can further exacerbate their belonging uncertainty and dissonance to impact the construction of a strong engineering identity. For all these reasons AfA engineering students may perceive a lack of social connectedness to the academic context. Under these circumstances integrating a professional engineering identity into their personal identity can be challenging for AfA students.

However, when one considers AfA engineering students in HBCU, *belonging certainty* to the institution may be the norm. For AfA engineering students in HBCU institutions, the emotional connection of common history and shared experiences, their numerical majority status, and most importantly being in a cultural space where they can embrace their ethnic identity stands in contrast to the numerical and often stigmatized minority status of AfA engineering students in PWI. Not surprisingly, AfA engineering students are likely to feel a sense of social connectedness and unquestioned belongingness to the institution designed specifically to promote their academic, intellectual, and professional advancement. Indeed, research demonstrates that AfA students at HBCUs experience lower levels of isolation, and overt racism, and higher levels of retention compared to African American students in PWIs (Harper, Carini, Bridges, & Hayek, 2004; Sparks, 2015). Consequently, HBCU AfA engineering students are less likely to experience the levels of belonging uncertainty or suffer its consequences to the extent that AfA engineering students in PWI may experience. However, with regard to their professional and career engineering identities, students from both institutions may experience belonging uncertainty. Therefore, this study is designed to understand the meaning and connotations of belonging uncertainty vs belonging certainty to the institution and to the engineering profession based on focus-group interviews with AfA engineering students

from PWI and HBCU institutions. As discussed in the next section we also examine the AfA engineering students' perceived institutional, instructional, and interpersonal opportunity structures—or lack thereof—that informs their experiences at the two institutions and impacts the integration of their personal and professional engineer identity.

Opportunity Structures and Belonging Uncertainty

More recently, Gray and colleagues (Gray, Hope, & Matthews, 2018) outlined the opportunity structures—interpersonal, instructional, and institutional—that can potentially support AfA students' sense of belonging and decrease their feelings of belonging uncertainty. In this study, we define these opportunity structures as affordances that help minority AfA engineering students to develop a sense of belonging to the institution and overcome any uncertainty they may have regarding their identity as engineering students working toward a professional engineering identity. *Interpersonal* opportunity structures exist when AfA engineering students perceive faculty/ advisors/ and other mentors at the university facilitate social ties to the context. Such social ties might reflect connections among peers or connections between students and faculty/ advisors/ and other mentors at the university. Essentially, it includes faculty, administrators, peers/, and classmates who make AfA minority engineering students feel accepted in the academic context. *Instructional* opportunity structures are created when AfA engineering students perceive faculty as supportive of their academic needs, as sensitive to their cultural identity and their numerical majority/minority status in the academic context. (e.g. recognizing that Black social identity or as Black and/or female engineer identity can create a sense of cultural dissonance and taking steps to ensure that students experiencing such dissonance feel included in the learning context). Finally, *institutional* opportunity structures are created when African American engineering students perceive that university, college or department is providing opportunities for minority students such that it helps them

overcome societal and institutional barriers to promote their success in the engineering profession. For example, if AfA engineering students' perception that the institution provides them opportunities for membership in professional organizations and access to meaningful internships it is likely facilitate students' sense of belonging and assuage their belonging uncertainty concerns.

The presence of these opportunity structures, we argue, is likely to buffer students' feelings of institutional belongingness uncertainty and promote feelings of belonging certainty. However, considering AfA students' minoritized status in society, it is also possible that there is little difference in belonging uncertainty to the engineering profession between HBCU and PWI AfA engineering students.

Summary of Hypotheses

Based on the literature reviewed we hypothesize that AfA engineering students in the HBCU compared to their counterparts in the PWI:

- 1) are more likely to be exposed to more interpersonal, instructional, and institutional opportunity structures'
- 2) will experience lower levels of belonging uncertainty in the institution.

We explore whether AfA engineering students' perceptions of the context of education (HBCU and PWI) impacts belonging uncertainty to the engineering profession.

Sample and Sample Selection

Data in this study were from 11 focus group interviews ($N_{\text{HBCU}}=6$; $N_{\text{PWI}}=5$). The sample included 65 AfA undergraduate engineering students (Freshman-Sophomore = 30; Junior-Senior – 35; 79% male). Students at HBCU were selected utilizing stratified random sampling. It is important to note that while the PWI included both engineering technology (ET) and engineering programs (EN), the HBCU offered only engineering majors and did not include engineering technology. Therefore, sample selection at the PWI included a further level of stratification by program.

Interview Protocol and Interview Process

The focus group protocol was constructed from protocols used in previous research on prejudice and discrimination among college, middle, and high school minority students that included AfA, Latinx, and Arab-American students (Author/s 2011; 2016). Open-ended questions provided interviewees ample opportunities for frank discussion about issues and concerns crucial to their lives in and outside the university (Creswall & Creswall, 2014; Kitzinger, 1995) . The protocol included questions regarding perceptions of the campus and engineering college context including faculty's cultural sensitivity and cultural responsiveness, perceptions of stereotyping and discrimination in societal and institutional contexts, their experiences of cultural dissonance and sense of belonging on campus and within the professional engineering community.

Focus group facilitators were of African or AfA descent to ensure rapport with participants. Students received a \$25 gift card for their participation. Focus group interviews were recorded and transcribed and later coded by an interdisciplinary team consisting of six individuals.

Coding and Analysis

Interviews were audiotaped and transcribed verbatim. Transcripts were then coded and analyzed with the assistance of QSR NVivo 11 software. Four analysts from diverse ethnic backgrounds coded the data. We utilized a qualitative phenomenological approach to conduct a comparative analysis of the experiences of AfA engineering students in the two types of institutions. A phenomenological approach describes what research participants have experienced, how they experienced it, and the meaning they associate to their experiences (Moustakas, 1994). Students shared their experiences and their perceptions of their institutions and their views on issues related to race, ethnicity, identity, sense of belonging, and career aspirations.

Initially, we developed a priori codes/ categories in accordance with the literature review. Next, each of the four researchers read the interviews to get a feel for interviewees' experiences in the two contexts – HBCU and PWI. Then each researcher conducted a deeper analysis of the data and pulled out emerging themes from the interviews. We discussed the emerging themes, compared them to the a priori

codes. We arrived at a consensus regarding the thematic categories (e.g., awareness of prejudice and discrimination, collective experience of prejudice and discrimination, personal experience of prejudice and discrimination, sense of belonging to the institution, sense of professional belonging) through dialogue and discussion. The initial set of themes were again coded and grouped into different opportunity structure categories that reflected the presence and absence of institutional, instructional, and interpersonal opportunity structures. With regard to *belonging uncertainty* code, those participants statements that reflected a general unease, discomfort or dissonance triggered by their experiences either in the classroom or around the campus were coded as belonging uncertainty. We also created a *belonging certainty* code when participants demonstrated a general feeling of comfort, or a global feeling of “this is where I belong.” To the extent possible, we attempted to describe what the participants were stating without inserting our interpretations. This enabled us to objectively organize the data and create codes that we determined authentically reflected participants expressed experiences.

Results

Analysis of 8 focus-group interviews (4 PWI and 4 HBCU) revealed some interesting contrasts and some commonalities.

Belonging uncertainty vs. belonging certainty

The PWI experience

As expected there were clear contrasts emerged between AfA engineering students’ experiences in PWI and HBCU. Across all four interviews PWI AfA engineering students’ statements reflected uncertainty regarding belonging to the institution. The statement below made by a junior-year AfA focus-group participant captures the essence of what several PWI AfA engineering students stated across the interviews:

Male Speaker: “Being a black engineering student at the University XX, it's not comfortable. It's not a comfortable learning environment for me. That's my personal opinion. It's harder to learn when you are always uncomfortable. As far as being nervous, some days you are more on the

defensive. It's kind of hard to describe. *You never really feel like you're in your place when you are going to school here.*”

This powerful and poignant statement demonstrating deep feelings of dissonance, discomfort and hurt—a classic illustration of belonging uncertainty in the institutional context. That this feeling started from the day some of these participants arrived to the PWI institution is exemplified in the following statements made by junior AfA engineering students during the interview:

Male 1: “You could tell your first day of class, people are looking at you like, why are you here. You don't feel like you belong.”

To which another participant responded:

Male 2: “I would probably say the same thing when it comes to engineering. . . you definitely feel like some people are thinking you are out of place. Like, does he know what he is doing here?”

These students’ perceptions that “people are looking at you;” or feeling that other people in the context doubt on these students’ ability to succeed in an engineering program given their AfA background; or the discomfort they experience because they believe that others in the engineering college context implicitly question the legitimacy of their presence in the college—regardless of whether others in the context thought this or not—speak to the participants’ belonging uncertainty at the PWI institution.

That this lack of social connectedness and belonging uncertainty persist even after they have been in the college for a couple of years is captured in the statements made by the same participant (male 2):

“There's been a couple times. There are examples where you choose group leaders for group projects. I am really a geek when it comes to technology. A lot of people don't see that when they first see me. I feel like in my computer classes, people think I don't know anything about what I am doing. I built my computer, had a couple internship experiences, all of that. But I feel like people think I don't know what I am doing. I heard so many things, just side remarks. For example, “I don't know if you know this, but.” I am like, “I definitely do know that.”

While the statements “A lot of people don't see that when they first see me” and “I feel like in my computer classes, people think I don't know anything about what I am doing” demonstrates feelings of

belonging uncertainty. This uncertainty is grounded in the reality of everyday experiences for this student and others like him when peers or faculty cast doubts on their ability to do the required work.

Participating students in other focus-group sessions also voiced their feelings of belonging uncertainty.

“You definitely have to prove yourself more. You know you are going to come in and they are going to have negative connotations about you like being lazy, being late, or that they are going to have to pick up the slack behind you. If you were a white engineer, you might already have a clean slate and they might just get to know you. If you are a black engineer, they may think you are not going to do what you are supposed to.”

In this statement this freshman AfA engineering student contrasts his belonging uncertainty with the perceived belonging certainty experienced by his White peers. Similar sentiments are echoed in the statement below.

“I feel like even when you go into a work force or whatever, I feel like you still gotta work ten times harder. They are going to look at you how formula SAE looks at me. They look at me like, I can't do as much as the next guy. So you have to be the one that proves them wrong. You got to do more. Just like his teacher said, I don't know if you know this. How do you know if I know it or not? It's something that constantly happens everywhere. How do you know I don't know how to use AutoCAD? To design a racecar? Just to do it yourself rather than helping someone.

In the work force, it's the same. You need to make sure you are the elite.” (Male, Senior year)

These quotes and similar statements made by PWI AfA engineering students demonstrates that their progress within the engineering program is stymied by concerns regarding the legitimacy of their presence in higher education programs such as engineering.

The HBCU experience

Belonging certainty was palpable in the enthusiasm participating AfA engineering students demonstrated when talking about their institution, the engineering program faculty and peers. This is well captured in the followings statements:

Male 1: “. . . It was all a feeling for me. I wanted to feel like I was at home when I chose a school. That was it. That was the only thing I was looking for. Somewhere I would feel good at.” (junior-year AfA student).

Male 2: “Before I came to [this institution], I always felt like I was one of a few black people in an area most of the time. Just anywhere when I took classes or went to work, I was one of few black people. I felt isolation from everyone else. When I came here to [this institution], I realized that feeling went away. That general uneasiness. I would say that is the sense of belonging I get from being around people like me.” (junior-year AfA student)

That general uneasiness the student (male 2) refers to is the feeling of belonging uncertainty the student experienced in various societal contexts. This transformed to feelings of belonging certainty at the HBCU institution. As the student pointed out, AfA students do not have to contend with the heightened awareness of being devalued numerical minority at an HBCU. It was a place that several participating students referred to as “home” not only because they were surrounded by people that “looked like me,” but also because “there are people who could relate to me, my problems, and help me better,” and “have the same goals.” Belonging certainty extended to the engineering program as well. This was evident in the extended conversations among the focus-group freshmen participants on the issue of “Black excellence.” One male participant explained Black excellence as follows:

“On campus, you really get a sense of black excellence. It's African Americans that you know are here to succeed and go on and go out to the world and do things and have a sense of accomplishment. Whereas in high school, people might be here because they have to be, but here it's because they want to be. They want to succeed.”

This statement demonstrates not only that the campus environment promoted academic excellence, but that these students had internalized the notion of Black success and excellence into their personal and professional identity. In other words, these students demonstrated the hallmarks of belonging certainty-positive affect and a global connectedness with the institution and the engineering program.

Professional Belonging Uncertainty

An unexpected finding that emerged from analyzing the interviews was that AfA students at HBCU experienced a higher level of belonging uncertainty when they discussed their job prospects. They perceived that industries and companies were distrusting of the quality of work of engineering students graduating from HBCU. The following discussions among junior year focus-group participants speaks to this generalized concern regarding fitting in the world of work.

Male 1: Managers and different people look at you in a certain light because not only the university in which you are coming from, but the color of your skin unfortunately. So, in those environments, I would say it does affect your self-image.

Male 2: Also, I know sometimes there's a stigma that when you come from an HBCU you are of lesser quality. That sometimes plays a factor.

Male 2: There's a lot of positive things that go on this campus, but they don't want to be around for that, they want to be around for the negative things that come out. That really is translated into the industry. If you have [this institution] on your resume, they start having a bias about it based on what they heard.

Male 1: They developed a stereotype

Male 2: If you were a white engineer, you might already have a clean slate and they might just get to know you. If you are a black engineer, they may think you are not going to do what you are supposed to.

While PWI AfA engineering students voiced similar concerns regarding job opportunities upon graduation, it was not linked to the institution they were attending.

Presence and/ or Lack of Opportunity Structures

In this section we discuss the presence or absence of support systems that enhanced their feelings of belonging to the institution, impacted their academic competence, and ultimately their professional identity as an engineer.

Interpersonal Opportunity Structures

AfA students across both institutions talked about the *availability of interpersonal opportunity* structures in their respective institutions. Students at both institutions mentioned names of faculty who really cared about their well-being. Students talked about faculty who “maintained an open-door policy” and “looked out for them” in more ways than one.

Focus-group participants at HBCU talked about the different ways in which faculty ensured their academic success and prepared them for a world of work- a world not as welcoming as the one the students were experiencing at HBCU. In the words of a female engineering student in her junior year:

“I feel like it's very important to have a good relationship with your teachers. Personally, get to know each other. Most teachers at this school really care about you and want to see you do good in life. They will look out for you. If they see you trying, they will most definitely try to help you out in any type of way.”

Or as another junior male student stated:

“Me personally, having Dr. A himself for a course, since freshman year I can really go to him with questions, concerns, comments. If I am feeling *a certain way he will give me a pep talk* or something of that nature to keep my head on straight.”

Thus, students perceived faculty as a source of academic and emotional support to ensure that students in their care made it successfully through the engineering program. They were also seen as the source information regarding professional opportunities including internship, as illustrated by this remark made by a senior HBCU student, “they [faculty] know you by name, they can say “Hey Armando, you're a pretty good student in my class, I know someone who has an internship in Orlando, do you want to check it out?””

Some students from the PWI institution also talked about their faculty as a source of support. A female student in the civil engineering program talked about professors who “really look out for you.” As she stated, “. I be in my professor's office all the time. I might pester them a lot but they really explain it

and take the time to reach out.” Another female student was quick to add “I go in there and say, can I get some oatmeal or something?” and he [the professor] gave me a bowl and keys to the microware.” She went on to say, “There's multiple people in the department that I think are pretty decent professors and are there to help with advice and academics.” A couple of PWI AfA engineering students talked not only about faculty but also about administrators who were supportive and helpful. One male engineering student fondly remembered a past dean who, he felt was very approachable. He said:

“That question makes me think about our past dean. He really did care a whole lot. I am not saying the new dean doesn't because I don't know him too well just yet, but our old dean was someone anyone could go to. He didn't have that closed-door policy. As big as he was and as successful he was, he made you feel like you were next to him.”

However, while HBCU students talked about peers and upper level students as sources of help and support, PWI students recalled more instances of discrimination and stereotyping by their peers. They felt a sense of alienation, of not having friends in the program, or as being the student who picked last for by peers for group projects. Overall, the engineering students at HBCU relative to PWI that identified far more interpersonal features of their institution that supported their learning and their social well-being.

There was a stark contrast between PWI AfA students and HBCU students in their descriptions of a *lack of interpersonal opportunity* structures particularly when they addressed issues of individual and collective description of prejudice and discrimination at the respective institutions. Not surprisingly, while students at HBCU dismissed discrimination as a non-issue at their institution, it was a very salient aspect in the lives of PWI students. Awareness of discrimination by peers and faculty at both the individual and collective dominated the discussions among focus-group participants at the PWI. As one senior PWI student recalled:

“There were a couple black guys at _____ when I was a freshman. I was eating with my engineering group. When you come into bioengineering, they put you in little groups. We were having lunch together. There were black guys standing at the exit. No one wanted to leave because they were scared to walk through the group of black guys. So, they asked me to go first

so I could move them out of the way so they could throw away their plates. That stuck with me for the last 5 years. I was like, that is crazy. . .

He went on to say:

“I got angry. I made them go and throw away their plates. I told them, those are people just like you and me. They are no different than I am, and you are sitting here eating lunch with me. But you won't throw away your plates because there's a group of big black football players standing there making noise? I tried to use it as a teaching moment for them so they could see, but I guess I was filled with a lot of emotion at the time so I made a scene.”

While the above example illustrates the kind of collective discrimination that AfA students at the PWI institution experienced, sometimes they were also personally at the receiving end of such discrimination by both peers and faculty. Students felt they were told more frequently than students from other groups that they would not ‘make it in the program’. Recalling an incident when the chemistry teacher told her she would not make it in the sciences, the student indignantly remarked during the interview:

“So out of all 40 people in this class you just looked at me and thought for sure I wasn't going to make it. You didn't think anyone else wasn't going to make it? I show up to class everyday.

They sit next to me and skip class, but I am not going to make it?”

Considering that at the time of the interview the student was in engineering program, she clearly was not deterred by the negative evaluation, however, it acted as an *obstacle interpersonal structure*, one that the student wanted to overcome at all costs. Other students discussed their classroom interactions with faculty who they felt were biased toward them “whether they realized it or not.”

“I think that there's some professors that have bias towards us, whether they realize it or not. I think they do. I can't say that every professor knows they are treating us a little different, but there was a case last semester where me and a group of me friends went to our professor's office together. I was the only black person in the group. We were trying to get help on this problem. I would ask a question and he would respond in a very like, negative, you should know this way. They literally asked the same question and he would try to break it down for them. After, we all

talked about it. They were like, why is he doing that to you? I said I have no clue. Not every professor is like that, but there are professor's that do that. I think he knows that. I still go to his office and there's tension between us.”

For this student the quality of relationship with the professor was clearly a source of tension. If students, particularly minority students who are also a numerical minority in the institution, feel that a mentor or faculty is not supportive of their learning, or do not demonstrate that they care, it can become an obstacle difficult to surmount. It is important to note that PWI AfA students recognized that not all faculty were biased or prejudiced.

Instructional Opportunity Structures

Analysis of the focus-group interviews demonstrated that there was considerable overlap between instructional and interpersonal opportunity (or obstacle) structures. In the example above, for instance, the tension-filled interpersonal relationship resulted in poor quality instructional support for the student. Indeed, when faculty did not recognize that every student, no matter what their background desires to learn and understand the course content, it becomes an instructional obstacle rather an opportunity structure for students. For example, when asked by the interviewer, “Do you feel like most of your teachers understand you even though you come from a different race?” an Engineering Technology male student in his junior year responded:

‘Some of them. I feel like some don't really get the concept because when you come from like a typically African American race--- he [the professor] went to a good school. I did not go to a good school. So, I wasn't prepared for college. My _____[nationality] professor laughed at me. It was a simple algebra thing, but he skipped a step. I got confused. I told him to show me, but he said he didn't have time to slow down the class for me and I don't know the way you learn, hahaha. He doesn't understand my race because we come from minority driven schools and our teachers don't teach us pre-cal in middle school and stuff like that.”

This is not merely an example only of lack of cultural sensitivity on professor's part, it is an example of dereliction of duty as a teacher. Again, this is not a reflection of students' perceptions of all engineering faculty. Students also reflected on professors and instructors at PWI who were culturally sensitive and mindful of their students' academic needs. Indeed, the same student went on to describe his advisor who provided him with the needed instructional support in terms of what he needed to do to transfer from Engineering Technology to Engineering Science.

" . . She [academic advisor] has been a lot more useful than I expected her to be. When I first got here I was MET, mechanical engineering technology. I was cool with it. *I didn't know the difference.* When I was taking these courses, I was like, this isn't what my best friend took. So I went to her and she explained the difference to me and really put in perspective what direction I wanted to go in. I might need to go back to MET unfortunately—"

Students at HBCU also talked about instructional opportunity structures often in the context of interpersonal academic and emotional support from faculty. As in the words of one junior-year engineering student:

"I know in some of my classes, like with Mr. _____, if I mess up—that is what I like about this school—the teachers care. The fact that they get on me means a lot. If they didn't care, they wouldn't say anything to me about it."

This perception of emphasis on students' academic success was evident in all the interviews conducted with HBCU engineering students.

"They are going to drive you in that direction. I know Dr. _____].He is an extremely well taught teacher and *he pushes us. If he sees you are not for engineering, he will advise you to go to another major.* He is going to try to push you in that right direction. If you are going to push for engineering, he is going to make sure you get it. He will work with you, but he is going to push you to the point where you are up to standards."

This student, a freshman engineering student at HBCU, recognized the authenticity of the instructional support provided by the faculty. The student recognized that the faculty was pushing him to do his best to

be ‘up to standard.’ He also felt that when the faculty advised students to change majors it came from a place of genuine care and interest in students’ academic success. It is important to compare the HBCU student’s statement regarding changing majors to the one reported by the female student’s statement presented earlier. It could be that the instructor at PWI was just as well meaning, however, salience of race and belonging uncertainty could potentially have affected the student’s perception of the faculty’s beliefs and intentions.

Institutional Opportunity Structures

Students from both institutions recognized the presence and the absence of institutional opportunity structures at their respective institutions. Across both institutions AfA engineering students talked about institutional opportunity structures in terms of available internships and co-ops. According to a junior-year HBCU participant:

“Here at the HBCU, you usually have a job guaranteed to you or you are prepared to have a job before you graduate. A lot of students here, before they graduate, already have a job or an internship or something to do. They are just waiting to graduate college to get the certificate, so they can start the job.” (Male junior-year engineering student)

“There's always a new opportunity here. Every other day or week I am hearing about a new internship. You can talk to a teacher or administrator and they may have something for you.

There's always a lot of companies, very prestigious companies, coming here for the career fair.

It's a really nice wealth of opportunities here”. (Male junior-year engineering student)

This kind of institutional support where the engineering department and engineering faculty maintain ties with industries and provide the necessary support for students to get jobs is to be applauded. Other ways HBCU AfA faculty were able to provide support was by instructing their students, who were all AfA was by proactively preparing them for the world of work and teaching them how to be professional.

“Yes. In my experience, being around faculty members that are also black and have been in the industry, they prepare you for the world. They tell you things. Something as simple as your

spelling in an email because they will critique you more because of the color of your skin. Just it's just little information about being professional and how we have to hold our standards a little higher just to be on an equal playing field. I feel I am being prepared here for that kind of environment.”

It is important to acknowledge that such mentorship meant specifically for AfA students may not always be possible for faculty from other social and ethnic groups and in the context of PWI where such advice may raise the specter of belonging uncertainty for AfA students.

As well, there are examples of institutional support at the PWI institutional. As one junior-year PWI student responded when asked why he chose the PWI engineering program said:

“I came here out of all the schools in the world, here they help you find co-ops. You get paid and you get experience. That was the key for me in coming to this school.”

Other students who participated in the same interview session reiterated:

“So, I had been going to [this institution] in high school forever. So, I was just like, this would be a good fit. They offered me a scholarship, save money. They had co-ops that were paid.

Everyone keeps saying co-ops but it was a really big thing. So that's how I decided to go into the program. Saving money and co-ops.” (Female engineering student).

“It is a big thing because not a lot of schools do it”. (Male engineering student).

Another institutional feature at the PWI was the availability of a scholarship program that made it possible for deserving students who might otherwise have not had the wherewithal to enroll in college or not have the economic capacity to enroll in the engineering program. This was evidently true for the junior-year male AfA engineering student. He said:

I am part of the _____ Excel Scholarship program. I have been a part of it ever since my freshman year of high school so I got a full ride. I knew I was going to come here. Plus, I still stay at home with my parents and everything and save money. So that is why I go to _____[university].

Other participating PWI AfA engineering students stated that the availability of scholarships made it possible for them to pursue a degree in engineering. Indeed, it was one of the major factors that drew these students to the institution. The significance of the co-op program and institutional affordability as important opportunity structures for prospective engineering students is well summed up in the words of this male freshman student:

“I came here-- the co-op program is really what drew me to the school. Then how affordable it was. With the co-op program and the affordability, I just felt it was a good choice to make. And it's a pretty competitive program. People kind of sleep on [this institution], but our program is accredited. We can hang with the other students from the area. There's a lot of big engineering schools in this region of the country. I feel like [this institution] begin the middle of that helps our competitiveness a little bit. Specifically, with the bioengineering program . . . some of the labs are cool”.

Both PWI and HBCU AfA engineering students were very cognizant of the opportunities associated with membership to the National Society of Black Engineers (NSBE) that was available to them. At both institutions many student participants acknowledged the active role their faculty—particularly PWI AfA faculty—played in encouraging AfA students to join NSBE, making statements such as “I was standing in line at registration and the president [NSBE president] pulled me out and said, you are coming to NSBE, right? I said, I guess so. We exchanged numbers and I went to the first meeting.” Even AfA focus-group participants at PWI, who were not members of the NSBE, acknowledged that they did not do so despite knowing about the organization and stated that they “hoped to join in NSBE” in the future. Below are examples of students views on the role of NSBE in their professional and social lives:

“For me, when I went to a lot of different information sessions and round tables, one of the things I found in common was a lot of people said something they look for in a person they hire is that you are a part of your college chapter of NSBE. NSBE gives a lot of different opportunities.

Almost everyone that goes to the NSBE conference comes back with a job. (HBCU male Freshman student, not yet a member of NSBE).

“The connections they have for you here. There's always someone I can meet with or give my information to. I can have my name put in the air”. (PWI male junior student, member of NSBE)

“I joined because it seemed like a good-- a networking opportunity. You are going to be around other black STEM majors that are trying to do what you are doing. It definitely presents itself as a good networking opportunity, so you will know people at conferences, dealing with companies, and people that look like you.”. (PWI male junior student, member of NSBE).

Thus, NSBE diluted the feelings of belonging uncertainty PWI AfA engineering students may have experienced in their classes and on campus. Surrounded by similar others created a sense of connectedness to other NSBE members and enhanced AfA students' competence in the engineering field. It also gave them opportunities to connect with professionals and senior engineering students.

HBCU AfA students talked about peer mentorship programs wherein senior students were enlisted to help junior students transition into the university in general, and the engineering program in particular. PWI AfA students, for often found themselves in a minority were unable to avail themselves of these kinds of mentorship programs. Indeed, as one female student noted that until she enrolled in NSBE in her junior year, she had no friends on campus. This lack of interpersonal connectedness takes its toll not only in terms of sense of belonging, it could snowball into students' inability to access other forms of support – instructional and institutional—even when these may be available.

Discussion and Scholarly Significance

The need to experience a sense of belonging to the institution and profession were expressed by students from both institutions. It was evident that HBCU students experienced a strong sense of relatedness and connection to the institution that was lacking in the conversations among the PWI students. The students at the PWI expressed a strong sense of black responsibility and the need to disprove the stereotypes about African Americans held by some of their peers and certain faculty. This pressure to prove oneself or to

prove their belonging at the institution was not present for HBCU students. There was also a keen awareness and desire among both PWI and HBCU students to fully embrace their “Black Engineer” identity. However, students’ remarks indicated that there was a certain level of belongingness uncertainty to the engineering profession among interviewees at both institutions. It is important to note that faculty at the HBCU institution provided direct mentorship and advice to their students regarding problems they are likely to encounter in the professional world. Whether this was effective in completely ameliorating students’ belongingness uncertainty to the engineering profession is unclear, but it has the potential to build students’ psychological strength and resilience while pursuing their careers. AfA students in the PWI would likely benefit from more targeted culturally sensitive mentorship programs and availability of more culturally appropriate opportunity structures. We will examine these issues further through individual interviews with students from both institutions. Of consequence, this study adds to the literature on the contextual impact on AfA students’ sense of belonging, belongingness uncertainty, and their perceptions of available opportunity structures in the learning environment.

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